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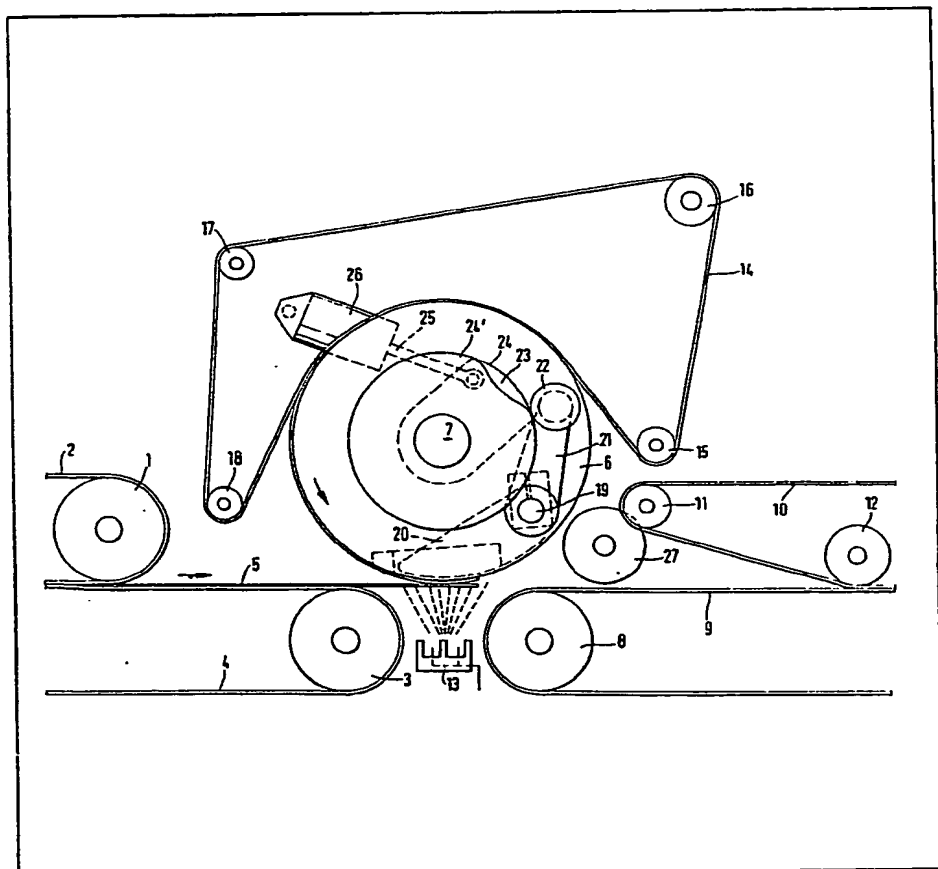
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 (71) Applicants  
 Windmüller & Hölscher,  
 Munsterstrasse 48—52,  
 454 Lengerich i.W.,  
 Lengerich, Federal  
 Republic of Germany  
 (72) Inventor  
 Fritz Achelpohl  
 (74) Agents  
 D. Young & Co.

(54) Apparatus for forming stacks from plastics film comprising an electrostatically charged stacking drum

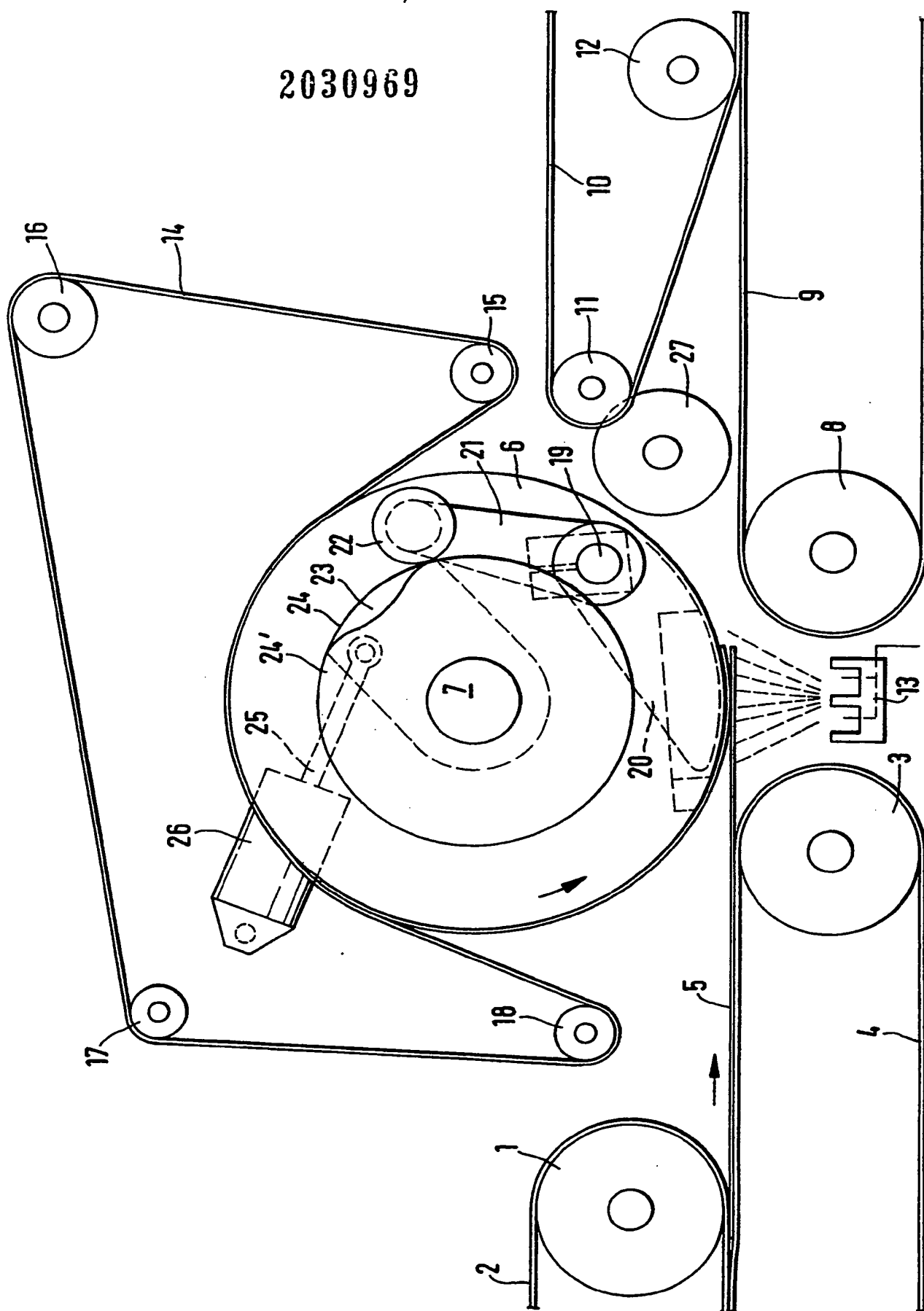
(57) In an apparatus for forming a stack of plastics sheet articles, the stack is built up on a rotary drum 6 to

which the articles 5 are successively fed at regular intervals. The sheet articles are electrostatically charged by an electrode 13 disposed opposite to the drum 6 so that they adhere to the drum until stripped therefrom by a cam-operated lever 20 projectable from within the drum.



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## SPECIFICATION

**Apparatus for forming stacks from flat workpieces of plastics film comprising an electrostatically charged stacking drum**

5 The invention relates to an apparatus for forming stacks of flat workpieces from plastics film, for example web sections or plastics bags, comprising a stacking drum which is disposed above a conveyor successively supplying the workpieces and which is provided with at least one lever radially pivotable to beyond the drum surface and back again for releasing the leading ends of the stacks formed thereon, and comprising a conveyor which receives the stacks released from the stacking drum and takes them away.

10 In an apparatus of this kind known from DE—OS 25 00 964, the stacking drum is provided with a row of needles extending along a line on the surface, or two rows of needles offset at 180° to each other, these needles spiking the workpieces to be stacked at their leading edge until the desired stack height has been reached and co-operating with a counter jaw which consists of a rubber bar and is secured on a drum rotating at the same circumferential speed. To release the leading ends of the stacks formed on the stacking drum, a pivotable stripper is provided which pushed the spiked stack off the needles.

15 The known apparatus is not only expensive because a rotary drum has to be provided to carry the rubber bar co-operating with the rows of needles but the workpieces are also not adapted to be stacked thereby without damage because they have to be perforated so as to fix them to the stacking drum.

20 It is therefore the problem of the present invention to provide an apparatus of the aforementioned kind with which flat workpieces can be combined on a stacking drum to form stacks in a simple manner and without damage.

25 According to the invention, this problem is solved in that an electrode producing a strong D.C. voltage field is directed onto the surface. In the apparatus according to the invention, one dispenses with mechanical means for fixing the workpieces to be stacked onto the stacking drum or for fixing each last workpiece on the growing stack; instead, use is made of the attracting force between the strong electric D.C. voltage field between the electrostatically charged workpieces or between the workpieces and the stacking drum.

30 From US Reissue Patent No. 27 771 as well as German Gebrauchsmuster Specification 72 44 160 it is known to use electrodes for electrostatically charging thermoplastics films extruded through wide slot nozzles so that the films will subsequently adhere well to the surface of a quenching drum without air inclusions in order substantially to avoid undesirable constricting of the film during cooling.

35 It is also known electrostatically to charge paper and plastics webs so that they will adhere smoothly, correctly, without air inclusions, cleanly and in frictional engagement with supporting or

65 cooling rollers.

Finally, it is known electrostatically to charge paper or plastics webs as they are being coiled into rolls so as to avoid telescoping of the roll.

70 In the apparatus according to the invention, a rectified high voltage of up to several 100,000 volt is applied to the electrode, which produces an electric D.C. voltage field of adequate field strength. In this electric D.C. voltage field, the individual workpieces to be stacked are charged so that the adhesive property resulting therefrom causes them to adhere to the stacking drum or to the growing stack.

75 The surface of the stacking drum forms the counter-electrode which is desirably insulated from the shaft which mounts the stacking drum in the machine frame.

80 Desirably, an endless belt which can be applied to the drum surface is provided over part of the periphery of the stacking drum in a zone opposite to the electrode. This belt, which is desirably elastically resilient, prevents particularly the trailing part of the stack from being flung over as a result of the centrifugal forces.

85 Other advantageous constructions of the invention have been described in the subsidiary claims.

90 One example will now be described in more detail with reference to the drawing in which the single figure is a diagrammatic side elevation of the apparatus for forming stacks.

95 The workpieces 5 to be stacked are fed to the stacking drum 6 by a double belt conveyor of which the upper belt 2 runs over the direction-changing drum 1 and the lower belt 4 runs over the direction-changing drum 3. The stacking drum 6 is secured on the shaft 7 which is mounted in the machine frame. The direction-changing drum 3 is offset in the conveying direction relatively to the direction-changing drum 1 and is so disposed in front of and beneath the stacking drum 6 that the conveying plane defined by the upper run of the belt 4 is substantially tangential to its surface.

100 Behind the stacking drum 6 there is a double belt conveyor to which finished stacks are transferred from the stacking drum and which takes the stacks away, the lower belt 9 of the double belt conveyor passing over the direction-changing drum 8 and the upper belt 10 over the direction-changing drum 11 as well as the guide roller 12. The direction-changing drum 8 is offset against the conveying direction and, in relation to the vertical axial medial plane of the stacking drum 6, disposed symmetrically to the direction-changing drum 3.

105 In the gap between the direction-changing drums 3 and 8 there is the electrode 13 which is directed towards the surface of the stacking drum 6 and is connected to a generator (not shown) by way of a high tension cable (not shown), the generator supplying the electrode with a rectified high voltage up to several 100,000 volt. The electrode 13 is in the form of a rail extending over the axial length of the surface of the stacking drum 6. The metallic surface of the stacking drum 6

forms the counter-electrode.

A pressure belt 14 guided over the rollers 15 to 18 runs over part of the upper periphery of the stacking drum 6. One of the rollers 15 to 18 is resiliently mounted so that the pressure belt 14 can yield as the height of the stack increases.

The surface of the stacking drum 6 has circumferentially extending grooves containing levers 20 secured on the shaft 19 mounted in the stacking drum 6. A further lever 21 secured to the shaft 19 carries a cam roller 22 at its free end. The cam roller runs over plates 24, 24' which are concentric with the axis of the drum 6 and fixed with respect to the frame, the plate 24' being provided with a recess 23. The plates 24, 24' are closely juxtaposed. By means of the piston rod 25 of the piston-cylinder unit 26 which has its cylinder hinged to the machine frame, the plate 24 can be so turned towards the plate 24' that the recess 23 of the plate 24' is covered by the arcuate surface of the plate 24. If the cam roller 22 moves into the recess 23, the lever 20 is swung out beyond the surface of the stocking drum 6 and releases the stack formed thereon, which subsequently enters the gap formed by the belts 9, 10 of the double belt conveyor for taking the stacks away.

In order that the stacks will be pressed onto the lower belt 9, a pressure roller 27 is disposed above the lower belt 9.

The workpieces running off the upper run of the conveyor belt 4 enter the electric D.C. voltage field formed by the electrode 13 and are provided with an electric charge in this field. By reason of this charge, they are attracted by the surface of the stacking drum or by the workpieces that have already been stacked thereon. The workpieces 5 are fed to the stacking drum 6 at a speed equal to the circumferential speed thereof and at a mutual spacing so that edge-aligned stacks are formed thereon. As soon as a stack containing a predetermined number of workpieces has been collected on the stacking drum 6, counting and control means (not shown) actuate the piston-cylinder unit 26 so that the stack is released from the stacking drum 6 by the levers forming a stripper and transferred to a discharge belt conveyor which moves at the same speed as the

circumferential speed of the stacking drum 6 at least at the instant of transfer.

Paperwork pieces can also be stacked on the apparatus as described.

The principle of the invention for forming stacks by utilizing the electrostatic forces of electrostatically charged workpieces can also be employed to form flat stacks in that the workpieces to be stacked are subjected to the D.C. voltage field produced by the electrodes.

#### CLAIMS

1. Apparatus for forming stacks of flat workpieces of plastics film, for example web sections or plastics bags, comprising a stacking drum which is disposed above a conveyor successively supplying the workpieces and which is provided with at least one lever radially pivotable to beyond the drum surface and back again for releasing the leading ends of the stacks formed thereon, and comprising a conveyor which receives the stacks released from the stacking drum and takes them away, characterised in that an electrode (13) producing a strong D.C. voltage field is directed onto the surface.

2. Apparatus according to claim 1, characterised in that the surface is electrically insulated from the shaft (7) which mounts the stacking drum (6) in the frame.

3. Apparatus according to claim 1 or claim 2, characterised in that the surface is of metal.

4. Apparatus according to one of claims 1 to 3, characterised in that the surface is provided with radial grooves or built up from rings in or between which there are mounted the levers (20) which form strippers.

5. Apparatus according to one of claims 1 to 4, characterised in that an endless belt (14) which can be applied to the drum surface is provided over part of the periphery of the stacking drum (6) in a zone opposite to the electrode (13).

6. Apparatus according to claim 5, characterised in that the belt (14) is resiliently applied to the surface.

7. Apparatus for forming stacks of flat workpieces of plastics films constructed and arranged substantially as hereinbefore described and shown in the accompanying drawing.